



Protecting the Soldier

Key Question: How did uniforms protect soldiers in the Battle of Palo Alto?

Relevance to Student Knowledge:

Students wear particular clothes to protect against the environment. Students also wear clothes for certain groups, such as band and sports uniforms. These clothes – from warm jackets to padded shoulders – protect students while allowing for free movement.

Student Learning Objectives: Students will understand how uniforms protected the soldiers. Students will investigate the absorbency, wicking rate, and burn rate of wool and cotton, the fabric of the soldier's uniforms.

Texas Essential Knowledge & Skills

History: 4.3 (D) Impact of the Mexican War

Mathematics: 4.12 Measurement concepts

Science: 4.1 (A) Safe practices during field investigations

Science: 4.2 (A-E) Scientific processes

Science: 4.7 (A) Observe and record changes in the state of matter due to the addition and reduction of heat

Materials Included

- Master student worksheet **Properties of Wool/Cotton**
- Master student worksheet **Protecting the Soldier**
- Teacher historical background information

Teacher-Supplied Materials

- Copies of student worksheet **Properties Wool/Cotton**
- Copies of student worksheet **Protecting the Soldiers**

Have enough materials for groups of 4 students

- Samples of wool & cotton
- Candles & Matches
- Pie Pans
- Cups
- Rubber Bands or String
- Paper Clips
- Stop Watch
- Balance and Masses
- Water
- Food Coloring
- Hand Lens

BACKGROUND: Information about the uniforms on the enclosed list.

For more information on U.S.-Mexican War uniforms, check out these websites:

- <http://www.aztecclub.com/uniforms/uniform-a.htm>
- <http://www.dodgenet.com/~ghostgar/ggbook/GGbook.html>

Uniforms were made out of wool because of the fabric's properties. When soldiers sweat, wool would wick water away from the skin. If it rained, wool would absorb the water, keeping the soldier warm and dry. Wool burns very slowly. If a spark got on the soldier's clothing, he could quickly put it out.

Wool*

- Comes from fleece of sheep, camels, llamas, goats, rabbits
- After cutting off fleece (shearing), it is sorted (graded) by the width and length of the fibers. It is then cleaned of oils, dirt, bugs, and bits of vegetation. The wool is washed and dried, untangled and combed (carded). Finally, it is twisted into yarn for weaving into fabric.

Wool Properties

- Holds a lot of water – absorbent
- Can be used to absorb blood
- Has an odor when wet
- Burns slowly, Ashes break easily
- Smells like burning hair
- Insulates in both cold and hot weather

MANAGEMENT

1. Preview the activity and conduct tests. Review safety procedures. Select a safe area for the burn test.
2. Gather supplies.
3. Cut sample fabrics according to amounts needed for experiments. (Enough for groups of 4 students/group)
4. Have an ample supply of water.

Vocabulary

- Replica: A copy that is exact in all details
- Property: Quality of something (in this case fabrics)
- Absorbency: Ability to take in or suck up
- Wick: To absorb
- Flammability: Capable of being set on fire

Cotton*

- Grows from the seeds of the cotton plant as long fibers
- Removed in a cotton gin (engine). The fiber is twisted into yarn and thread. These are woven together to make the fabric.

Properties

- Holds a lot of water – 27 times its weight
- Has no odor when wet
- Burns slowly with a bright yellow flame
- Leaves puffy gray ash that breaks easily
- Smells like burning paper

*Information from AIMS Education Foundation 2001 CRAZY ABOUT COTTON

LESSON

Introduction

1. Ask students: What do you wear when it rains? Why do you wear those things? List responses.
2. Ask students: Do you ever wear clothes for certain groups, such as band and sports? Why do you think you wear those clothes? (Elicit: protection, allow for movement) List responses.

Discovery

1. Tell students that they will learn about the properties of wool and cotton, the fabric of the replicas.
2. Define *property* or have students look up the definition.
3. Ask students: What properties do fabrics have? List responses. (Elicit: absorbency, flammability)
4. Define the following or have students look up the definition.
 - Wicking
 - Absorbency
 - Flammability
5. Tell students that they will test the wicking rate and absorbency of cotton and wool.
6. Split students into groups of four.
7. Hand out the student worksheet **Material Properties**.
8. Have students predict the description of each property.
9. Tell students that they will do the luster, texture, wicking, and absorbency experiments.
10. Review safety procedures.
11. See **Wicking, Absorbency, and Flammability Experiments** page to help students conduct the experiments.
12. When finished, have students return the materials.
13. When students are finished, conduct the flammability experiments in a safe area.
14. Have students complete their worksheets.

Wrap-up Activities

1. Tell students: During the Battle of Palo Alto, uniforms protected the soldiers.
2. Pass out the student worksheet **Protecting the Soldier**.
3. Ask students: Think of the following:
 - Wicking Rate
 - Absorbency
 - Flammability

LESSON

Extensions

1. Conduct further tests in the properties of wool and cotton.
2. Research how modern uniforms protect soldiers
3. Have students design their own uniform. Students must explain how the uniform offers protection.

Student Evaluation/Assessment: Observe students during the tests and for group and class participation.



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Wicking, Absorbency, and Flammability

WICKING EXPERIMENT

Key Question: Based on the wicking rate, why were the soldier's uniforms made of wool?

Materials: (Enough for groups of 4 students/group)

- Wool and cotton strips (1 inch by 4 inches)
- Pie Pans
- Rubber Bands or String
- Paper Clips
- Water
- Stop Watch
- Food Coloring (**Optional**)

ABSORBENCY EXPERIMENT

Key Question: Based on the absorbency rate, why were the soldier's uniforms made of wool?

Materials: (Enough for groups of 4 students/group)

- Wool & cotton strips (wide enough to cover the cups)
- Pie Pans
- Cups (three/group)
- Rubber Bands (two/group)
- Water

WICKING EXPERIMENT

1. Pass out materials or have students gather the materials.
2. Have students put water in the pie pans.
3. Have students attach the rubber bands or string to the pie pans so it stretches across the top.
4. Have students prepare the stop watch to time the experiment.
5. Have students attach the wool to the rubber band or string with the paper clip. The edge of the strip should touch the water.
6. Have students time how long it takes water to move up to the top of the piece of wool.
7. Repeat with the piece of cotton.

ABSORBENCY EXPERIMENT

1. Pass out materials or have students gather the materials.
2. Have students put water in the cups.
3. Have students attach the strip of wool to the cup so it stretches across the top and attach it with a rubber band.
4. Have students **slowly** pour one cup of water over the wool. Tell them to let the water soak in before pouring more water to prevent spilling water.
5. Repeat with the piece of cotton.
6. Have students compare the amount of water in the cups.

FLAMMABILITY EXPERIMENT

1. Select a safe spot outdoors for the burn experiment.
2. Determine the mass before the test. Burn a few threads of each fabric. Repeat for observations.
3. Determine the mass after the test.



Properties of Wool

Name: _____



Property	Prediction	Actual
Shine/Luster How does it look?		
Texture How does it feel?		
Absorbency How much water can it hold?		
Wicking Rate How fast can it wick water?		
Flammability How fast does it burn?		



Properties of Cotton

Name: _____



Property	Prediction	Actual
Shine/Luster How does it look?		
Texture How does it feel?		
Absorbency How much water can it hold?		
Wicking Rate How fast can it wick water?		
Flammability How fast does it burn?		



Protecting the Soldier

Name: _____



Uniforms protected soldiers during the Battle of Palo Alto.

Pretend you are a soldier in the Battle of Palo Alto. Explain how wool and cotton would react in these battle situations. Include the following in your answers:

- Flammability
- Absorbency
- Wicking Rate

DURING THE BATTLE ...	WOOL	COTTON	WHICH IS BETTER? WHY?
A spark from your musket (your gun) lands on your jacket			
The heat of the battle makes you sweat			
A bayonet (a weapon like a sword that fits on the end of a gun) cuts your arm			